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## Colorado Department of Public Health and Environment Health Facility Acquired Infections Disclosure Initiative Semi-Annual Bulletin: Volume 4, No. 2, December 2011 Dialysis Event Reporting in Colorado

### Introduction

This report was written to fulfill the requirements set forth in the Colorado Hospital-Acquired Infections Disclosure Act. The Act requires hospitals, hospital units, ambulatory surgery centers and dialysis treatment centers to report health facility-acquired infections data as a condition of their state licensure. The Colorado Department of Public Health and Environment (CDPHE) is the lead state agency administering the initiative. CDPHE is required to produce semi-annual bulletins disclosing the results of the data collected. The National Healthcare Safety Network (NHSN) is the national web-based surveillance and reporting system for health facility-acquired infections (HAI), managed by the Centers for Disease Control and Prevention (CDC). Reporting of HAIs in Colorado began in August 2007 for central line associated bloodstream infections and surgical site infections and in 2010 dialysis centers began reporting HAIs.

This bulletin contains information about hemodialysis and the increased risk of infection for hemodialysis patients as well as aggregate Colorado specific dialysis event data. In 2010, Colorado became the first state to require outpatient dialysis centers to report HAIs using the NHSN system.

### What is Hemodialysis and ESRD

Hemodialysis (HD) is the most common treatment for end-stage renal disease (ESRD) and is typically needed when an individual only has use of 10 to 15 percent of their kidney function.<sup>1</sup> During HD, a machine filters wastes, salts and fluid from the blood when the kidneys can no longer function effectively. In essence, HD takes over the kidneys' job and functions to help control blood pressure and maintain the proper balance of fluid and various chemicals in the body.<sup>1</sup> It also aids the body in maintaining proper acid-base balance. HD is often performed about three times per week from 3-5 hours per session.<sup>1</sup>

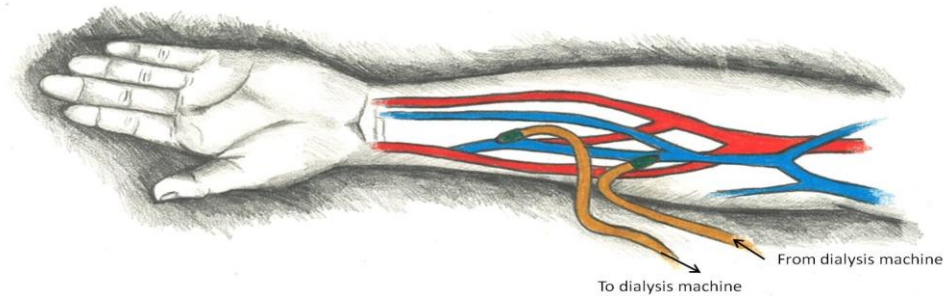
Common causes of kidney failure include:<sup>1</sup>

- Diabetes
- High blood pressure (hypertension)
- Kidney inflammation (glomerulonephritis)
- Blood vessel inflammation (vasculitis)
- Polycystic kidney disease (cysts in the kidney)

Preparation for HD begins several weeks to months before the first treatment because a vascular access to the bloodstream needs to be created. This is where the blood is removed and returned during dialysis. There are three basic kinds of vascular access for HD: **arteriovenous (AV) fistula, AV graft, and venous catheter.**

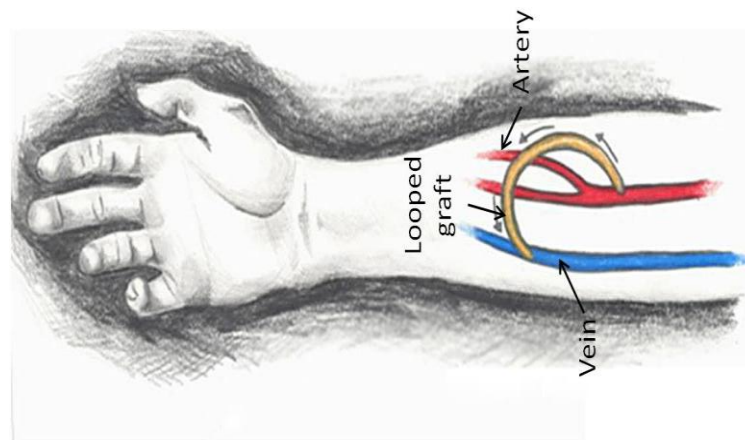
## Common HD access types:

- **Arteriovenous (AV) fistula**



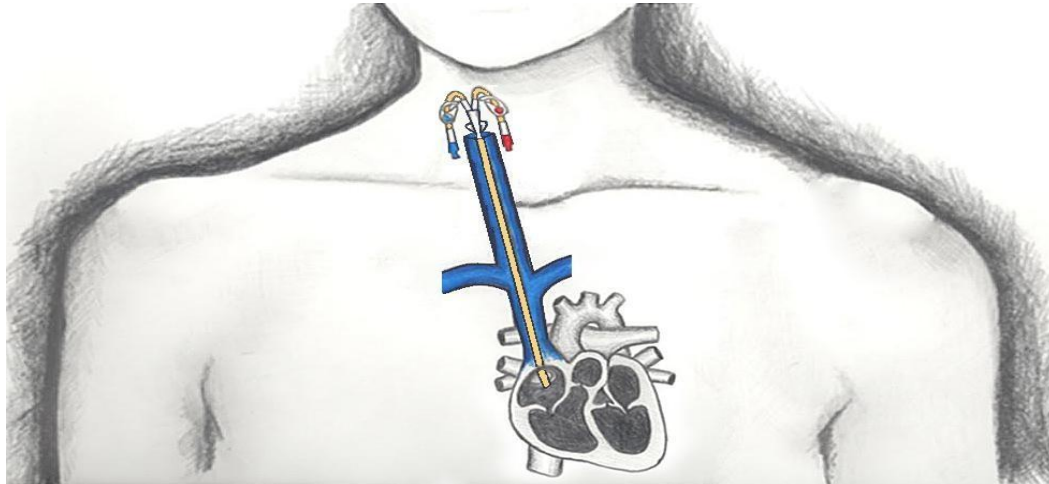
An AV fistula is created by surgically connecting an artery directly to a vein, usually in the forearm. Connecting the artery to the vein causes more blood to flow into the vein. As a result, the vein grows larger and stronger, providing easy access to the blood system. This makes repeated needle insertions for HD treatments easier. AV fistula formation requires advance planning because a fistula takes time to develop after surgery. The AV fistula is a good long-term vascular access for HD because it provides adequate blood flow, lasts a long time, and has a lower complication rate than other types of accesses. However, there is still risk for infection at the access site and low blood flow due to blood clotting in the access.<sup>3</sup>

- **Arteriovenous (AV) Graft**



An AV graft is a vascular access that uses a synthetic tube (or graft) to connect an artery to a vein under the skin in the arm. The graft functions as an artificial vein that can be used repeatedly for needle placement and blood access during HD. A graft does not need time to develop as a fistula does, so it can be used sooner after placement.<sup>3</sup> Because the graft material is plastic, or other synthetic material, it can be more susceptible to infection. Treatment of the infection, or other complications, may necessitate the removal of the graft.<sup>2</sup>

- **Venous Catheter**



A catheter is a tube inserted into a vein in the neck, chest, or leg near the groin, with at least two chambers to allow a two-way flow of blood. A temporary catheter is commonly used for immediate treatment needs, and before a more permanent HD access is established. Sometimes a fistula or graft surgery is unsuccessful, and a long-term catheter access is needed. Catheters that will be needed for long-term access are designed to be tunneled under the skin to increase comfort and reduce complications; however tunneled catheters are also prone to infection. Catheters are not ideal for permanent access because they can clot, are the most likely to become infected, and narrow the veins in which they are placed.<sup>3</sup>

#### **Increased risk for infection**

HD patients are at increased risk for infection due to the nature of their disease and the exposures they encounter. Impairment of kidney function can reduce the efficacy of the immune response, leaving ESRD patients at higher risk for infection. Frequent contact with people during regular visits in the dialysis clinic can increase risk for infection of communicable diseases like influenza virus. Additionally, dialysis centers need to take special care to reduce transmission of hepatitis B infections, a bloodborne virus. Hepatitis B is more easily transmissible than other common bloodborne viruses, and remains viable on surfaces for up to seven days.<sup>4</sup> While dialysis machines are designed to protect patients, they can potentially introduce pathogens into the bloodstream.<sup>2</sup> The risk of infection for a patient varies depending on multiple factors, including the type of HD access and other underlying medical conditions of the patient.

#### **Reportable Dialysis Events in Colorado**

In 2008, over 350,000 patients were being treated with HD in the United States.<sup>4</sup> Frequent hospitalizations and receipt of antimicrobial drugs put HD patients at high risk for infection with drug-resistant bacteria. This has led to increased scrutiny for bloodstream and localized infections within this population. Colorado became the first state to require all outpatient HD centers to report HAIs beginning March 2010.

The Dialysis Events (DE) as defined by the NHSN are:<sup>5</sup>

- **Intravenous (IV) antimicrobial start:** All outpatient administration of intravenous antibiotics is included. At least twenty-one days must pass between the end of the antibiotic start and the beginning of a second antibiotic start for two starts to be considered separate dialysis events.
- **Positive blood culture:** A positive blood culture is when a patient has the presence of bacteria or fungus in their blood. All positive blood cultures collected as an outpatient or collected within one calendar day after a hospital admission are included. At least twenty-one days must pass between positive blood cultures for each positive blood culture to be considered a separate dialysis event.

- **Local access infection:** This includes each time the patient has one or more symptoms of pus, redness or increased swelling at a vascular access site. At least twenty-one days must pass between the onset of a first and second episode of pus, redness, or increased swelling at a vascular access site to be considered separate dialysis events.

***\*\*Hospitalization for any reason was previously reported as a Dialysis Event and was discontinued in June 2011. Hospitalization is now reportable as an outcome of a Dialysis Event.***

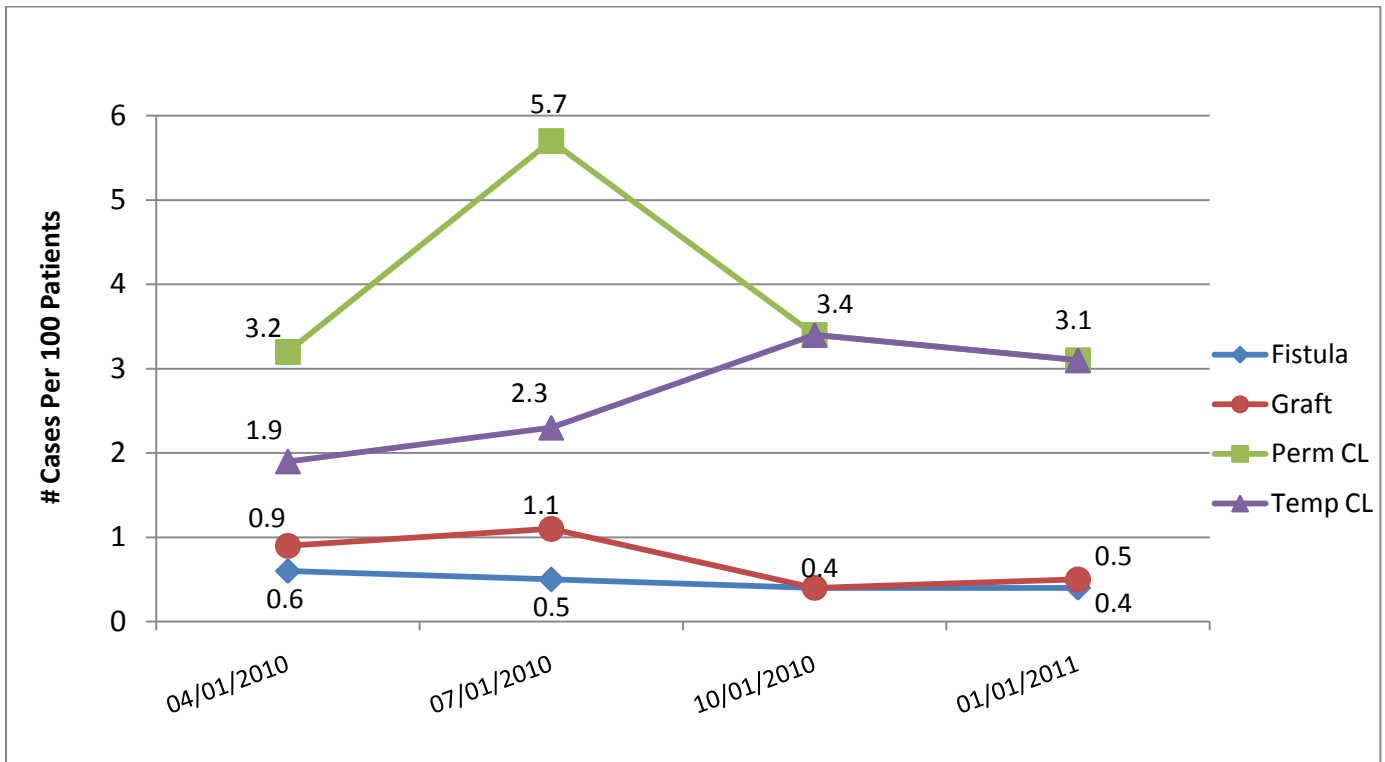
#### **Colorado HD infection data**

From April 2010 through March 2011, 59 reporting dialysis treatment centers reported serving 37,335 patients: 26,270 (70.3%) with fistulas, 4,593 (12.3%) with grafts, 5,162 (13.8%) with permanent central lines (PCL), and 1,310 (3.5%) with temporary central lines (TCL). Colorado dialysis centers are required to report an event that meets the surveillance definitions by NHSN. For each event, information is collected which calculate the presence of infections and classify them into either local access site infection or access related bloodstream infection. Both of these infections are considered vascular access infections. Local access infections (LAI) are those that occur near or at the location where the bloodstream is accessed for the purpose of HD. Access related bloodstream infections (ARBI) infections that involve bacteria in the patient's bloodstream. Dialysis event reporting started in Colorado in March 2010; these data summarize vascular access infection rate occurring between April 2010 and March 2011 (Table 1). During that time, there were a total of 664 vascular access infections, including 404 LAIs and 260 ARBIs. The overall vascular access infection rate was 1.8 per 100 HD patients, and the rate of LAIs and ARBI rates were 1.1 infections and 0.7 per 100 HD patients, respectively. Patients with PCLs had the highest rates of infection (LAI, 3.9; ARBI, 2.8) and patients with fistulas had the lowest rates (LAI, 0.5; ARBI, 0.2). The graphical representation of this data can be found in Figures 1 and 2.

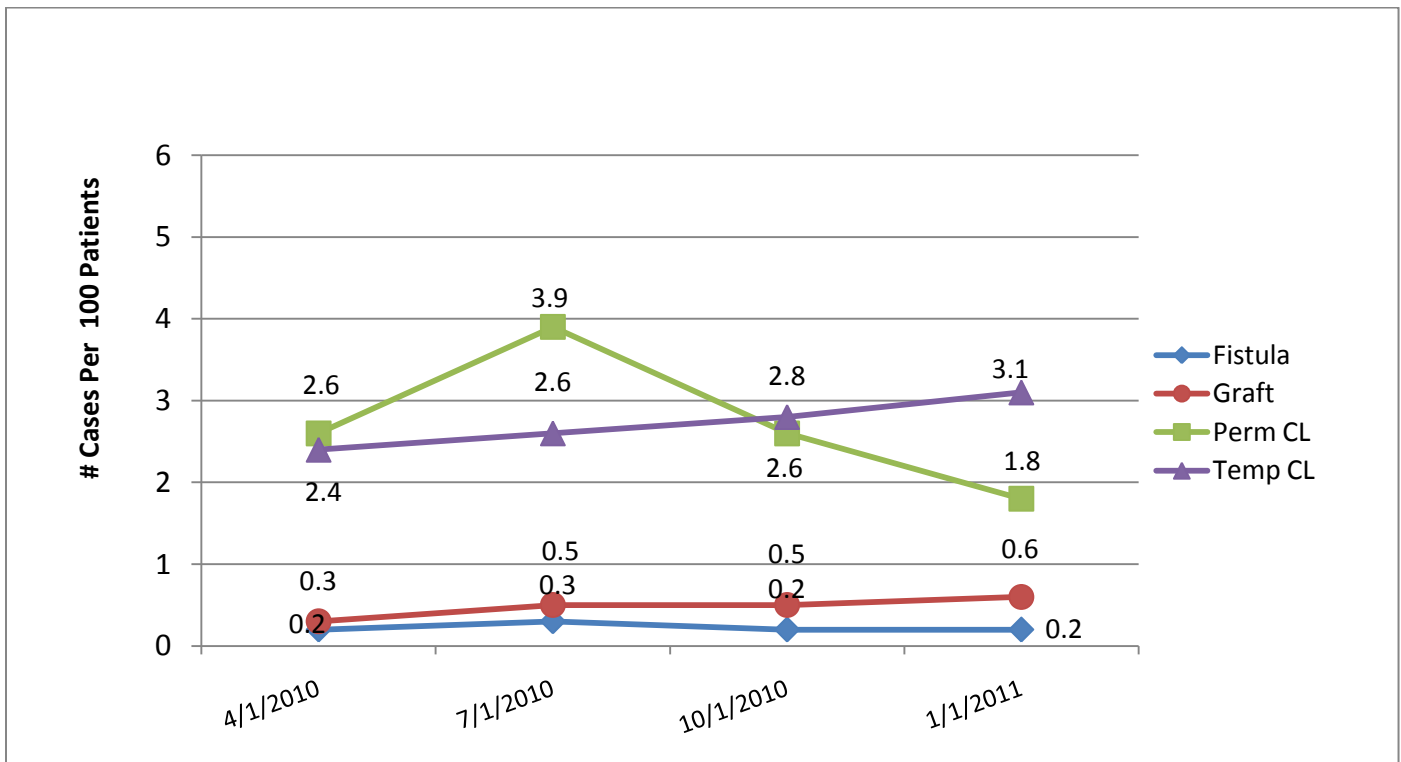
**Table 1. Dialysis Infection Counts & Rates by Infection & Access Types: April 2010 - March 2011**

<b>Infection Type</b>	<b>Access Type</b>	<b>Infection Count</b>	<b>Patient Count</b>	<b>Rate per 100 Patients</b>
<b>Vascular Access Infection (LAIs + ARBIs)</b>				
	All	664	37,335	1.8
	Fistula	176	26,270	0.7
	Graft	57	4,593	1.2
	PCL	342	5,162	6.6
	TCL	69	1,310	5.3
<b>Local Access Infection (LAI)</b>				
	All	404	37,335	1.1
	Fistula	121	26,270	0.5
	Graft	35	4,593	0.8
	PCL	199	5,162	3.9
	TCL	34	1,310	2.6
<b>Access Related Bloodstream Infections (ARBI)</b>				
	All	260	37,335	0.7
	Fistula	55	26,270	0.2
	Graft	22	4,593	0.5
	PCL	143	5,162	2.8
	TCL	35	1,310	2.7

**Figure 1. Local Access Infection Rates in Colorado Dialysis Treatment Centers: April 2010 - March 2011**



**Figure 2. Access-Related Blood Infection Rates in Colorado Dialysis Treatment Centers: April 2010 - March 2011**



## Cautions

There are some cautions to consider when interpreting these data in this report. Infections are not the only adverse event that may occur in healthcare. It is important to weigh other factors in judging the quality of healthcare. Consumers should always consult with their doctor, healthcare facility, health insurance carrier, family and friends before deciding where to receive care. Consumers should consider the experience of the facility, staff and other quality of care indicators.

## HD infection reduction strategies<sup>6</sup>

The Association for Professionals in Infection Control and Epidemiology (APIC) published a Guide to the Elimination of Infections in Hemodialysis which provides a detailed description of particular challenges in infection control for HD clinics. They provided the following list of opportunities for infection reduction. Infection control in this population is not the responsibility of any one person or entity, but requires efforts on the part of center staff, patients, and members of the patients' families.

1. **Environmental cleaning/disinfection:** Environmental cleaning is the cleaning of all surfaces that the patient can touch or that touch the patient (e.g., chair, armrests, bedside table top/counter, and drawer/cupboard handles) as well as the surfaces that the dialysis staff touches (e.g., exterior surfaces of the HD machine, computer screens, and keyboards). Cleaning all surfaces with soap and water, should be done first, followed by cleaning with a disinfectant.
2. **Equipment cleaning/disinfection:** All equipment should be considered contaminated after a patient dialysis session. Some equipment should be dedicated for single patient use (e.g., external venous and arterial pressure transducer filters/protectors, adhesive tape, and cloth-covered blood pressure cuffs). The internal HD machine dialysate pathway should be subjected to heat disinfection at the end of each treatment day. Non-disposable instruments (scissors, hemostats, clamps, etc.) should be sterilized.
3. **Hand hygiene:** Dialysis employees must use soap and water or an alcohol-based hand rub to clean hands. It is important for employees to clean hands **before and after** contact with a patient or patient environment. Hands must also be cleaned after removing gloves.
4. **Immunizations for patients and employees:** The vaccine status of all patients should be assessed at the start of dialysis. All HD patients that are eligible should be immunized against hepatitis B virus, tetanus, pneumococcal disease, and flu. All employees in HD settings must receive immunization for measles, mumps, rubella, pertussis, diphtheria, tetanus, MMR (measles, mumps, rubella).
5. **Medication/injection safety:** Medication vials with only **one dose** should be used and should be dedicated to one patient. Medications should be prepared in designated clean areas and away from patient treatment stations. The IV access and medication vials should be cleaned before the patient receives the medication. Infusion supplies (e.g., needles, syringes, flush solutions, administration sets, or IV fluids) should be dedicated to a single patient.
6. **Patient/family/employee education:** HD facilities should have a designated individual that is responsible for educating employees and patients on infection prevention and control in the HD setting.
7. **Pre-/postsurgical infection prevention:** The night before and the morning of the surgery the patient should bathe his/her entire body, focusing on cleansing the area of the access site. Health facility staff should remove excess hair with clippers immediately before the surgery and outside of the operating room to prevent contamination. Patients should contact their surgeon if they experience any of the following symptoms after surgery:
  - The incision is swollen, red, warm, or there is the presence of pus
  - Stitches comes apart
  - Bandage becomes soaked with blood
  - Development of a fever
  - Absence of thrill in a fistula or graft (A thrill or bruit must be present to ensure that the vascular access is working. Thrill is defined as a rhythmic vibration that can be felt over a fistula or graft. A bruit is a sound that is heard when listening to the vascular access with a stethoscope.)
  - New bulging of the access
  - Fingers become blue, cold, or numb
  - Severe pain in the access site.

The patient and caregivers can also do their part to prevent infection by avoiding touching the skin around the access site, being mindful of hand hygiene practices and wearing gloves when cleaning the wound, making sure the access is covered with a clean and dry dressing, making sure the patient's clothes do not compromise

the access, and wearing a mask when connecting/disconnecting the catheter from the blood lines during dialysis. Patients should also inquire about fistula exercises that encourage fistula development to shorten the amount of catheter time.

8. **Standard/Transmission-Based Precautions:** In HD settings, the risk for exposure is increased because the bloodstream must be accessed during dialysis, patients are in close proximity to one another, and staff are in frequent contact with multiple patients and equipment. Thus, standard precautions are used to protect the patient and the dialysis staff from infection from blood and other body fluids. Personal Protective Equipment (PPE) **must** be worn and includes masks, gowns, face shields, goggles, and gloves. Patients and dialysis staff must wear a mask if the patient has a catheter vascular access and especially if they are experiencing upper-respiratory illness. Dialysis staff should wear disposable protective gowns or fluid-resistant lab coats, which should be replaced if they become soiled or wet; gowns should be replaced in between patients. Gloves should be worn at all times and should be changed when moving from one patient or machine to another; changed after cannulation; and changed when moving from a dirty to a clean site or task on the same patient. Hand hygiene should be performed each time between glove changes. A face shield or goggles should be worn by staff during the initiation/discontinuation of dialysis and should be discarded or disinfected after use between patients.
9. **Vascular access—infection prevention during insertion and care:** All types of catheters require careful skin preparation and strict aseptic technique. Thorough hand washing should be performed prior to insertion. The person that will be inserting the catheter should use maximal sterile barrier precautions (e.g., wear a mask, cap, sterile gown, and sterile gloves) and the patient should be covered by a large sterile drape. After insertion, the catheter exit site should be checked for proper position and absence of infection before accessing the bloodstream. The catheter site dressing should be changed every 3-7 days and the catheter insertion site should be cleaned/disinfected at the time of the dressing change.  
For a permanent access – graft or fistula – the skin around the access should be kept clean and dry and the access should be cleansed with soap and water before each dialysis session. Patients should check the access daily for signs of infection and feel for the presence of a “thrill.”
10. **Water treatment/testing:** Product water must be tested regularly for presence of pathogens
11. **Infection surveillance:** The major components of infection surveillance are standardized definitions, monitoring the population at risk for infection, statistical analysis, feedback of results to primary caregivers, and feedback to managers and senior leadership. Outcome indicators (infection rates) form the basic data for most surveillance and quality improvement activities. Facility-wide documentation is maintained on dialysis-associated infections, as well as performance improvement goals and interventions.
12. **Quality improvement program:** The 2008 ESRD Medicare Conditions for Coverage now require all dialysis facilities to include infection prevention/control as a formal part of quality assurance and performance improvement. Under this program, all dialysis facilities must analyze and document infections to identify trends and establish baseline information on incidence; and develop recommendations and action plans to minimize infection transmission, promote immunization, and take actions to reduce future incidents.

## Resources for consumers

Healthcare quality means that patients get the right medicine, treatments, and medical tests at the right times for their condition. There are many resources available to inform decisions about quality care, infection data and rates, questions to ask your doctor, and where to receive healthcare. Some examples are listed here:

Centers for Disease Control and Prevention

[www.cdc.gov](http://www.cdc.gov)

Kidney school

[www.kidneyschool.org](http://www.kidneyschool.org)

Network 15

<http://www.esrdnet15.org>

National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)

[www.niddk.nih.gov](http://www.niddk.nih.gov)

National Kidney & Urologic Diseases Information Clearinghouse (NKUDIC)

[kidney.niddk.nih.gov/index.aspx](http://kidney.niddk.nih.gov/index.aspx)

Association for Professionals in Infection Control and Epidemiology

[www.apic.org](http://www.apic.org)

## References:

1. The Mayo Clinic: <http://www.mayoclinic.com/health/HD/MY00281>
2. American Association of Kidney Patients: <http://www.aakp.org/aakp-library/infections-in-hemodialysis-patients/index.cfm>
3. US Department of Human and Health Services: <http://kidney.niddk.nih.gov/kudiseases/pubs/vascularaccess/index.aspx>

4. US Renal Data System, USRDS 2009 Annual Data Report: Atlas of End-Stage Renal Disease in the United States, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD 2009. <http://www.usrds.org/adr.htm>
5. Centers for Disease Control and Prevention: [http://www.cdc.gov/nhsn/psc\\_da\\_de.html](http://www.cdc.gov/nhsn/psc_da_de.html)
6. Association for Professionals in Infection Control and Epidemiology: [http://www.apic.org/content/navigationmenu/practiceguidance/APICEliminationGuides/APIC\\_Hemodialysis\\_web.pdf](http://www.apic.org/content/navigationmenu/practiceguidance/APICEliminationGuides/APIC_Hemodialysis_web.pdf)

**Pictures of the vascular access types provided by Rachel Yarbrough.**



